Applications of Digital Communications in Transportation Engineering

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Transportation Issues

- Aging
- Congestion
- Security
- Safety
- Air quality

Sources:
- Town of Carmel
- jsonline
- lucianne.com
- Review-Journal
- The World Bank
"Intelligent transportation systems (ITS) encompass a broad range of wireless and wire line communications-based information and electronics technologies. When integrated into the transportation system's infrastructure, and in vehicles themselves, these technologies relieve congestion, improve safety and enhance American productivity."

-- ITS America
ITS Technologies

UDSOT 9 Initiatives 2004

Safety
Integrated Vehicle Based Safety Systems
Cooperative Intersection Collision Avoidance System
Next Generation 9-1-1

Mobility
Integrated Corridor Management Systems
Mobility Services for All Americans
Clarus
Emergency Transportation Operations

Global Connectivity
Universal Freight Manifest

Cross Cutting: Vehicle Infrastructure Integration
Clarus: Demonstration of a regional road weather observational data management and forecasting system
Convergence of Technology
Vehicle Infrastructure Integration (VII)

- Satellite to Vehicle GPS
- Communication
- Hot Spot (WIFI)
- Vehicle to Cellular
- Vehicle-to-Vehicle DSRC
- Vehicle-to-Roadside DSRC
- Traffic Management Center (TMC)
- Private Sector Uses
- Telematics Service Providers

DSRC = Automotive Safety Radio – High Availability – Low Latency

DSRC

Frequency - GHz

<table>
<thead>
<tr>
<th>Frequency - GHz</th>
<th>5.470</th>
<th>5.825</th>
<th>5.850</th>
<th>5.925</th>
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<tr>
<td>Unlicensed UNII-WiFi WiMax</td>
<td>172</td>
<td>174</td>
<td>176</td>
<td>178</td>
</tr>
<tr>
<td>Optional 20 MHz</td>
<td>5.855</td>
<td>5.865</td>
<td>5.925</td>
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<tr>
<td>Control</td>
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</tbody>
</table>

*High Availability and Low Latency
VII Applications

- 110 VII applications identified
- Focus areas:
  - Highway Safety
  - Vehicular Mobility
  - Consumer convenience
  - Public and private enterprise
- Let us look at more…
DSRC

Video: VII Demo

Example Safety Apps

Intersection collision avoidance

Source: [www.technologyreview.com](http://www.technologyreview.com)
Example Safety Apps

Cooperative merging / lane change

OBU – On-board unit
RSU – Roadside unit
TMC – Traffic management center

Example Mobility Apps

Intersection scheduling
Example Mobility Apps

In-vehicle driving assistance

VII @ UMass

1. RSU is warned of traffic light turning red
2. Message sent to red car asking for speed and position
3. OBU sends back speed and location
4. RSU calculates whether red car will run red light
5. If yes, blue car warned

GOALS
- Real-life demonstration
- Running light warning only
- Involves only two cars
- Technical Documentation
What’s next?

Integrated transportation testbed

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